

Amendments to the Specification:

Please replace the paragraph starting on page 5, line 8 with the following paragraph

In the MPEG standard, the quantizer is generally created with a base quantizer value and a quantizer adjustment. In a base quantizer adjustment stage, the encoder calculates a buffer occupancy accumulator which is defined as difference between the actual number of bits used to encode a frame and the requested bits for the previous video frame of the same video frame type. The buffer occupancy accumulator is used to improve the next estimate. In order to achieve a smooth quality transition, the system of the present invention limits the changes to the buffer occupancy accumulator with respect to the target number of bits of the current frame. For example, in one embodiment, the buffer occupancy accumulator for P-frames is allowed to change a maximum of 40 % from the previous the buffer occupancy accumulator and for I-frames (Intra-frames) the buffer occupancy accumulator is only allowed to change a maximum of 15 % from the previous the buffer occupancy accumulator. Limiting the change of the buffer occupancy accumulator will prevent one odd significantly different frame from significantly changing the quantization.

Please replace the paragraph starting on page 5, line 2 with the following paragraph

Furthermore, an encoder implementing the teachings of the present invention will ~~improved~~ improve upon the quantizer adjustment by making more accurate estimates of the amount information needed to encode each macroblock. In the reference MPEG-2 Test Model 5 implementation, a video encoder employs a uniform bit allocation model for all different video frame types such that the expected number of bits per macroblock is constant whether the frame is an intra-frame or an inter-frame. In the system of the present invention, the digital video

encoder incorporates a more accurate distortion-rate model, wherein the distortion rate model used to estimate bits per macroblock may vary from frame type to frame type. Specifically, for frame types with motion compensation, the present invention exploits the correlation between the complexity of the macroblock and the number of bits needed. In the case of frame types without motion compensation, the present invention imposes a model that biases bit allocation towards smaller activity macro blocks.

Please insert the following paragraph starting on page 7, line 10

10 **Figure 3** illustrates the base quantizer assignment process in some embodiments.

Please insert the following paragraph starting on page 7, line 13 after inserting the above description of Figure 3

15

Figure 4 illustrates the quantizer adjustment process in some embodiments.

Please insert the following paragraph starting on page 7, line 16 after inserting the above description of Figure 4

Figure 5 illustrates a process for calculation of the delta value used in computing the quantizer adjustment in some embodiments.

Please replace the paragraph starting on page 11, line 17 with the following paragraph

Detailed information on the MPEG-2 Test Model 5 (TM5) can be found in the official

MPEG-2 documentation and on the Internet, at the web site for the Motion Pictures Expert

5 Group at <http://www.mpeg.org/MPEG/MSSG/tm5/>.

Please replace the paragraph starting on page 17, line 24 with the following paragraph

Later, the base quantization parameter (q_base) is limited to stay within an

10 adaptively determined finite range in order to always allow for further quantizer adjustment. For example, suppose the digital video encoder grossly overshoots the bit budget for the $(n-1)^{th}$ frame and the j^{th} macroblock of the n^{th} frame is undershooting the bit budget. In this case, if the base quantization parameter (q_base) is not clipped to a finite range, the digital video encoder may not be able to adjust for the undershoot. Figure 3 illustrates the above described base

15 quantizer assignment process in some embodiments.

Please insert the following paragraph starting on page 19, line 28

Figure 4 illustrates the above described quantizer adjustment process in some

20 embodiments. Figure 5 illustrates a process for calculation of the delta value used in computing
the quantizer adjustment in some embodiments.